DECENTRALIZED PREDICTION MARKETS

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INTRODUCTION

Decentralized prediction markets (DPM) are innovative platforms that integrate predictive forecasting with blockchain technology.[1] These platforms present themselves as user-friendly interfaces akin to traditional websites. Behind the scenes, operations are distributed across a blockchain, ensuring that no single entity controls the market and thus, enhances their security, transparency, and resistance to censorship. Users participate in predicting outcomes of various events, from elections to market trends.[2] DPMs aggregate the collective wisdom and opinions of their participants, essentially crowdsourcing forecasts on a variety of topics.[3]

For attorneys, understanding DPMs is important for several reasons. First, they represent a novel application of blockchain

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[1] *What is a Decentralized Prediction Market?*, HORIZEN ACADEMY, https://www.horizen.io/academy/decentralized-prediction-markets/ [https://perma.cc/P5MW-53TK].

[2] *Id.*

[3] *Id.*

technology.[4] Second, these markets have undergone aggressive regulatory scrutiny from the Commodities Futures Trading Commission (CFTC), which oversees commodity, futures, and options markets.[5] Finally, these decentralized markets raise novel legal questions, especially in the realms of financial regulation and consumer protection.[6]

This Technology Explainer begins in Part I with a general overview of prediction markets. Part II explains the mechanisms underlying DPMs, their benefits and limitations, and provides a case study of Polymarket. Part III ends with a discussion of DPMs' regulatory landscape in the United States.

I. PREDICTION MARKETS: AN OVERVIEW

Prediction markets are platforms where individuals can buy and sell contracts based on future event outcomes.[7] These markets harness the wisdom of crowds to generate forecasts that often surpass the accuracy of traditional, namely polling, prediction methods.[8] The essence of prediction markets is their ability to aggregate diverse opinions and information through market mechanisms, thereby converting dispersed data into predictive insights reflected in the market price of contracts.[9]

Prediction markets generally work in the following way: participants stake money on contracts that represent their prediction for an event's outcome–essentially buying shares of that outcome. The market price of the contracts then adjusts up or down based on the collective predictions. The underlying mechanism is rooted in the supply and demand dynamics inherent to any market.[10] For example,

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[4] Hayley Hopkins, *Regulatory Challenges to Decentralized Derivatives Protocols: Reviewing CFTC's Polymarket Order*, COLUM. L. BUS. REV. (Feb. 15, 2022), https://journals.library.columbia.edu/index.php/CBLR/announcement/view/494 [https://perma.cc/QT5E-ADUV].

[5] *Id.*

[6] *Id.*

[7] Justin Wolfers & Eric Zitzewitz, *Prediction Markets*, 18 J. ECON. PERSPECTIVES 107, 107 (2004).

[8] Clay Graubard & Andrew Eaddy, *Forecasting, Prediction Markets and the Age of Better Information*, NASDAQ (June 4, 2022, 11:59AM), https://www.nasdaq.com/articles/forecasting-prediction-markets-and-the-age-of-better-information [https://perma.cc/4D46-TUK7].

[9] *See* Robin Hanson, *Combinatorial Information Market Design*, 5 INFO. SYS. FRONTIERS 107, 110 (2003).

[10] Kenneth Arrow, Robert Forsythe, Michael Gorham, Robert Hahn, Robin Hanson, John O. Ledyard, Saul Levmore, Robert Litan, Paul Milgrom, Forrest D. Nelson, George R. Neumann, Marco Ottaviani,

if many participants believe a certain candidate will win an election and stake money on that outcome, the demand for contracts representing that outcome increases. As demand for these contracts goes up, so does their market price, reflecting the collective belief in the likelihood of that event occurring. Conversely, if fewer participants stake money on that outcome, indicating a collective assessment that the candidate is unlikely to win the election, the demand for contracts representing that outcome decreases, leading to a lower market price. This dynamic pricing mechanism allows prediction market prices to serve as a real-time aggregate of participants' beliefs regarding the likelihood of future events, serving as valuable tools for decision-making across sectors.[11]

II. DECENTRALIZED PREDICTION MARKETS (DPMS)

DPMs have redefined the landscape of forecasting by offering a platform where individuals can bet on the outcomes of future events without centralized oversight. Such platforms confer numerous benefits such as transparency, user autonomy, democratized market creation, and mitigation of counterparty risk. The underlying backbone of DPMs is blockchain technology, or distributed ledger technology (DLT) more broadly. DLT is a digital recordkeeping system where transactions and their details are recorded in multiple computers at the same time.[12] Unlike traditional databases, DLT has no central storage or administration functionality. Blockchain is a specific type of DLT that ensures the immutability, transparency, and integrity of each transaction.[13]

A. How DPMs Operate

DPM operations begin with a market creator who determines the event's conclusion timeline and selects a designated reporter to ascertain the event's outcome.[14] Participants in the market predict

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Thomas C. Schelling, Robert J. Shiller, Vernon L. Smith, Erik Snowberg, Cass R. Sunstein, Paul C. Tetlock, Philip E. Tetlock, Hal R. Varian, Justin Wolfers & Eric Zitzewitz., *The Promise of Prediction Markets,* 320 SCIENCE 877, 877–78 (2008).

[11] *Id.*

[12] *See* Guatami Tripathi, Mohd Abdul Ahad & Gabriella Casalino, *A Comprehensive Review of Blockchain Technology: Underlying Principles and Historical Background with Future Challenge*s, 9 DECISION ANALYTICS J. 1, 1 (2023).

[13] *Id.*

[14] Jack Peterson, Joseph Krug, Micah Zoltu, Austin K. Williams & Stephanie Alexander, *Augur: A Decentralized Oracle and Prediction*

event outcomes by trading binary tokens representing these outcomes–labeled as 'Y-token' (Yes-token) for affirmative predictions and 'N-token' (No-token) for negative forecasts.[15] During this process, the shares' value fluctuate between $0 and $1 based on supply and demand dynamics,[16] aligning with $1 for the correct outcome and $0 for the incorrect outcome after the event. The determination of outcomes is entrusted to an oracle, which consists of individuals or entities tasked with reporting the event's actual outcome in the real world.[17] For instance, in a scenario where both outcomes are equally likely, each token would initially be valued at $0.5.[18] Following the event, the value of the token corresponding to the accurate prediction would rise to $1, transferred from those who predicted incorrectly to those who predicted correctly.[19]

An early example of a DPM event in action concerned whether Ethereum co-founder Vitalik Buterin would wear a hat in a given week.[20] Users who thought he would wear a hat purchased Y-tokens, while users who believed he would not wear a hat purchased N-tokens. When Buterin ultimately wore a hat in a televised public appearance, the N-tokens became worthless while the Y-tokens' value surged to $1.[21]

The outcome reporting process in DPMs via oracles is crucial for their accuracy and reliability and can take two different approaches: token-based oracle incentives and centralized oracles. In the former approach, the platform launches a native token, which can be staked by oracle service providers.[22] In exchange, part of the fees are shared with them. Token-based oracle systems thus incentivize accurate reporting through rewards, encouraging participants to honestly report event outcomes. With centralized oracles, by contrast, the platform itself acts as an oracle in the early stages and chooses not to issue a token.[23] This approach, seemingly at odds with the decentralized ethos, introduces the risk of platform manipulation, but

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Market Platform, ARXIV (2022), https://www.augur.net/whitepaper.pdf [https://perma.cc/52DZ-4MM7].

[15] *What is a Decentralized Prediction Market?*, *supra* note 1.

[16] *Id.*

[17] *Id.*

[18] Graubard & Eaddy, *supra* note 8.

[19] *Id.*

[20] Clear Chain Capital, *The Resurgence of Decentralized Prediction Markets*, MEDIUM (Jul. 21, 2021) https://medium.com/coinmonks/the-resurgence-of-decentralized-prediction-markets-a-potentially-new-form-of-social-media-a76fcf41d98c [https://perma.cc/S2JD-743W].

[21] *Id.*

[22] *Id.*

[23] *Id.*

also helps to keep things stable until the project becomes more established.[24]

B. Benefits of DPMs

DPMs address numerous concerns inherent in centralized prediction markets via blockchain technology. Blockchain's immutability and transparency mitigate fraud risk, while smart contracts democratize market creation and reduce counterparty risk. DPMs overcome additional limitations of centralized platforms by offering resilience to censorship and providing anonymity, privacy, flexibility, and scalability.

Blockchain's immutability and transparency are pivotal for DPMs. The distributed nature of blockchain ensures transaction records are permanent and visible to all participants, reducing the risk of fraud and enhancing trust among users.[25]

DPMs transform the prediction market landscape via smart contracts—computer code that automates agreements based on set criteria—enabling anyone to create markets on any real-world event without high startup costs or liquidity concerns.[26] This democratization not only broadens market diversity but also ensures transactions are executed transparently and efficiently without intermediaries.[27]

Additionally, DPMs significantly reduce counterparty risk inherent in traditional financial transactions.[28] Through smart contracts, transactions or payouts are automatically carried out once event outcomes meet predefined rules, minimizing the need for trust and the risk of default.[29] This advancement in prediction markets enhances operational transparency and trustworthiness, offering a more accessible and reliable platform for forecasting events.

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[24] *Id.*

[25] Patrick Buckley, *Blockchain-Based Prediction Markets*, UK ACAD. FOR INFO. SYS. CONF. PROC. 6 (2022), https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1005&context=ukais2022 [https://perma.cc/KPH7-6KYK].

[26] Peterson et al., *supra* note 14.

[27] Buckley, *supra* note 25.

[28] Ashish Sinha, Vanessa Purwin, Mohamed Damak & Erkan Erturk, *Smart Contracts Could Improve Efficiency and Transparency*, S&P GLOBAL (Sept. 2022), https://www.spglobal.com/en/research-insights/featured/special-editorial/smart-contracts-could-improve-efficiency-and-transparency-in-financial-transactions [https://perma.cc/ADA4-75L2].

[29] *Id.*

Another key attraction of DPMs is their resilience to censorship.[30] Centralized platforms often impose restrictions on users, such as limiting the participation of consistently successful bettors.[31] The decentralized nature of DPMs, however, ensures that users maintain autonomy, free from such unilateral restrictions.[32]

Moreover, DPMs offer anonymity and privacy features that address concerns about information disclosure present in traditional prediction markets. Participants may be hesitant to share predictions in centralized markets due to fears of social or professional repercussions, but blockchain technology allows for anonymous participation, enabling individuals to contribute without revealing their identities.[33] This fosters a more transparent and equitable exchange of information, ultimately enhancing the accuracy and reliability of predictions.[34]

Finally, the flexibility and scalability provided by blockchain technology enable DPMs to support a wide range of market types and sizes, from small private markets within organizations to large public markets open to global participation.[35] This adaptability ensures that DPMs can be tailored to meet the specific needs of various users and applications.[36]

C. DPM Limitations and Controversies

Despite the potential of DPMs, these platforms face some limitations and controversies. For instance, the risk of market manipulation remains a challenge. Front-running, which is when individuals with advanced knowledge of market movements exploit this information for profit, poses a threat to the fairness and integrity of prediction markets.[37] This occurred in the prior example of the 2016 prediction market concerning whether Ethereum co-founder Vitalik Buterin would wear a hat in a given week. As might be expected, Buterin promptly purchased the 'Y-token' and proceeded to wear a hat to his next televised public appearance.[38] However, front-running is a relatively rare phenomenon in the market today

[30] Clear Chain Capital, *supra* note 20.

[31] *Id.*

[32] *Id.*

[33] Buckley, supra note 24, at 8–9.

[34] *Id.*

[35] *Understanding DeFi Prediction Markets*, HEDERA https://hedera.com/learning/decentralized-finance/defi-prediction-market [https://perma.cc/5KPC-ZK3A].

[36] *Id.*

[37] Clear Chain Capital, *supra* note 20.

[38] *Id.*

because the outcome of most prediction market events is not controlled by a single market participant.[39]

DPMs have also faced ethical criticisms. Augur, a DPM platform based on the Ethereum blockchain first launched in 2014, came under fire due to Augur users' creation of markets betting on the deaths of public figures, including politicians[40]. The nature of these bets underscores the broader debate about the moral implications and potential misuse of decentralized prediction markets for encouraging harmful activities.

Most of the early DPMs also faced poor user experience, high transaction costs, and insufficient liquidity, thus fading into relative obscurity.[41] In 2020, however, advancements within the blockchain ecosystem and current events[42] gave rise to new platforms which have largely avoided these issues.[43]

D. DPMs today: Polymarket

Polymarket is currently the world's leading DPM, where users bet on topics ranging from sports and award show events to movements in cryptocurrency.[44] Polymarket's relative success compared to most other DPMs is attributed to three key aspects. First, Polymarket initially decided to deliver verdicts using a centralized oracle rather than utilizing token-based oracle incentives, thus minimizing volatility in user adoption.[45] Second, Polymarket ensures strong liquidity incentives by charging a 2% fee on each transaction that goes directly to liquidity providers.[46]

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[39] *Id.*

[40] David Floyd, *The First Augur Assassination Markets Have Arrived*, CoinDesk (Sept. 13, 2021, 4:12 AM), https://www.coindesk.com/markets/2018/07/25/the-first-augur-assassination-markets-have-arrived/ [https://perma.cc/V38J-LXKD].

[41] Clear Chain Capital, *supra* note 20.

[42] *Id.* ("As ETH scaling solutions such as Matic became functional (alongside the rise of the low-fee L1 solutions) the experience of making low value bets became more economical. Simultaneously, the presidential election and COVID introduced a unique set of binary outcome, global interest events. Finally, the BTC halving led to a surge in crypto prices and brought a whole new group of users into the crypto ecosystem.")

[43] *Id.*

[44] Steven Walgenbach, *Polymarket Analysis: The Future of Predictive Market Platforms*, Coinpaper (Jan. 15, 2024) https://coinpaper.com/3047/polymarket-analysis-the-future-of-predictive-market-platforms [https://perma.cc/L639-3SQK].

[45] Clear Chain Capital, *supra* note 20.

[46] *Id.*

Third, the platform appears to offer a more intuitive user experience than its competitors.[47]

III. REGULATORY LANDSCAPE

The global and decentralized nature of DPMs presents notable regulatory challenges, especially for the Commodity Futures Trading Commission (CFTC) in the United States. Key regulatory hurdles include asserting jurisdiction over decentralized networks, enforcing anti-money laundering (AML) and know-your-customer (KYC) requirements, and safeguarding investors against fraud.[48]

The CFTC's approach to prediction market regulation has historically been cautious. The Dodd-Frank Act of 2010, which expanded the CFTC's authority to include swaps[49] potentially relevant to prediction markets, amended the Commodity Exchange Act (CEA) to prohibit contracts deemed "contrary to the public interest" including: "(I) activity that is unlawful under any Federal or State law; (II) terrorism; (III) assassination; (IV) war; (V) gaming; or (VI) other similar activity determined by the Commission, by rule or regulation, to be contrary to the public interest." [50] This legislative backdrop led to increased scrutiny of prediction markets, as seen in the CFTC's actions against InTrade in 2012 for offering commodity option contracts to U.S. customers without proper compliance.[51]

The broad definition of "swap" under the CEA could potentially cover various financial contracts tied to external events or asset prices, bringing DPMs under the CFTC's purview.[52] In June 2021, Commissioner Dan Berkovitz stated that he "d[id] not see how [DPMs] are legal under the [CEA]" which "does not contain any exception from registration for digital currencies, blockchains, or 'smart contracts.'"[53] Berkovitz specifically expressed concern with

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[47] *Id.*

[48] Hopkins, *supra* note 4.

[49] A "swap" is a type of financial derivative contract consisting of an agreement between two parties to exchange specified assets, liabilities, or cash flows for a predetermined period.

[50] Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 745(b), 124 Stat. 1376 (2010).

[51] *CFTC Charges Ireland-based "Prediction Market" Proprietors Intrade and TEN with Violating the CFTC's Off-Exchange Options Trading Ban and Filing False Forms with the CFTC*, CFTC (Nov. 26, 2012),

https://www.cftc.gov/PressRoom/PressReleases/6423-12 [https://perma.cc/YTF6-NBGL].

[52] Commodity Exchange Act, 7 U.S.C. § 1a(47) (1934).

[53] *Keynote Address of Commissioner Dan M. Berkovitz Before FIA and SIFMA-AMG, Asset Management Derivatives Forum 2021*, CFTC (June 8,

the development of decentralized markets without regulated intermediaries, indicating that their absence could lead to fraud, counterparty failure, and money laundering.[54]

The CFTC's subsequent enforcement actions, namely the $1.4 million fine against Polymarket in 2021 for operating without registration, illustrate the Commission's readiness to enforce existing regulations upon DPMs.[55] Moreover, the legal battle involving DPM platform Kalshi in 2023 underscores the complex debate around the CFTC's regulatory reach and permissible market activities. Kalshi sued the CFTC for rejecting its proposal to use derivatives contracts for betting on congressional control, alleging that the Commission falsely deemed such contracts as violating the CEA for constituting unlawful gaming and other activities not in the public's interest.[56]

The Kalshi and InTrade enforcement actions showcase the difficulty of applying traditional regulations to decentralized technologies. While the expansive interpretation of "swap" allows the CFTC jurisdiction over diverse financial instruments, it also prompts questions about the suitability of these regulations for new and evolving market structures. Balancing the promise of DPMs for efficiency and democratization with the imperative to protect market integrity remains a challenge for regulators.

CONCLUSION

DPMs have emerged as a significant innovation, merging blockchain's capabilities with predictive forecasting's insights. However, the regulatory landscape presents a formidable challenge to their broader adoption and operation. The CFTC has scrutinized these markets under existing financial regulations, with the Dodd-Frank Act's expansion of the CFTC's authority over swaps potentially inclusive of DPM contracts underscoring the regulatory

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2021), https://www.cftc.gov/PressRoom/SpeechesTestimony/opaberkovitz7 [https://perma.cc/KN7H-MPBX].

[54] *Id.*

[55] *CFTC Orders Event-Based Binary Options Markets Operator to Pay $1.4 Million Penalty*, CFTC (Jan. 3, 2022), https://www.cftc.gov/PressRoom/PressReleases/8478-22 [https://perma.cc/K7X8-8ESW].

[56] Laura Matthews, *Predictions Market Kalshi Sues CFTC for Blocking Election Contracts*, REUTERS (Nov. 1, 2023) https://www.reuters.com/world/us/predictions-market-kalshi-sues-cftc-blocking-election-contracts-2023-11-01/ [https://perma.cc/55B3-HTYZ].

complexities DPMs face. Recent enforcement actions highlight the regulatory hurdles and the necessity for platform operators to navigate these with diligence. As DPMs continue to evolve, balancing innovation with regulatory compliance remains paramount. This dynamic regulatory environment necessitates ongoing dialogue between technologists, legal practitioners, and regulators to ensure that DPMs can fulfill their potential as robust, transparent, and fair forecasting tools without compromising market integrity.